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Dusting Cantaloupes for the Control of Some Diseases and Insects

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Showing results of vines dusted with copper-arsenate-lime mixture on left and untreated vines on right. Treated vines have maintained their vigor for production because of plant disease control. Untreated vines show complete collapse and premature melons.

University of Delaware. The United States Department of Agriculture cooperating

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DUSTING CANTALOUPES FOR THE CONTROL OF SOME DISEASES AND INSECTS

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The profitable production of cantaloupes in Delaware is usually limited because of the injury produced by plant disease and insect pests which are always prevalent. These pests seriously injure the vines to such an extent that a normal harvest is seldom secured.

During the past three years, investigations have been conducted on the plant diseases affecting the cantaloupe, watermelon and cucumber. It has been proven that the various plant diseases affecting the cantaloupe can be checked, thus allowing the vigor of the vines to be maintained for the production of a normal harvest with melons of quality. As the result of the investigations on the control of plant disease and insect pests, it is believed that the following recommendations will materially assist in the profitable commercial production of cantaloupes in Delaware. It has been determined through field work that the expense in checking the prevalence of the plant diseases and insects is slight compared with the greater returns because of the increased yield of melons.

The commercial production of cantaloupes is practically confined to Sussex and Kent Counties. The annual acreage planted to cantaloupes during the past five years in Delaware has averaged 3260 acres. Approximately twelve per cent of the farms in Delaware grow cantaloupes. The cantaloupe crop usually ranks about fourth in the total valuation of truck crops being preceded by asparagus, tomatoes and sweet potatoes.

The marketing of the Delaware cantaloupe crop is in strong competition with the crop from other commercial producing states. Delaware is considered one of the intermediate states in the commercial production of cantaloupes since the crop is harvested between the early and late commercial crops in other sections of the country. The total commercial harvest of cantaloupes in the United States is completed to the extent of 86% during July, August and September. The greater part of the cantaloupe crop in Delaware is harvested and shipped during July and August.

Plant Diseases of Cantaloupe in Delaware

The most prevalent plant diseases found on the cantaloupe in Delaware are commonly known as Downy Mildew, Leaf Blight or Rust, Leaf Spot, Mosaic and Anthracnose.

Downy Mildew (*Pseudoperonspora cubensis*): This is the most important disease in limiting the commercial production of cantaloupes in the state. During the wet growing seasons, late maturing crops are often a complete failure while with the average season a possible normal crop is often reduced twenty-five or fifty per cent. The disease becomes estab-

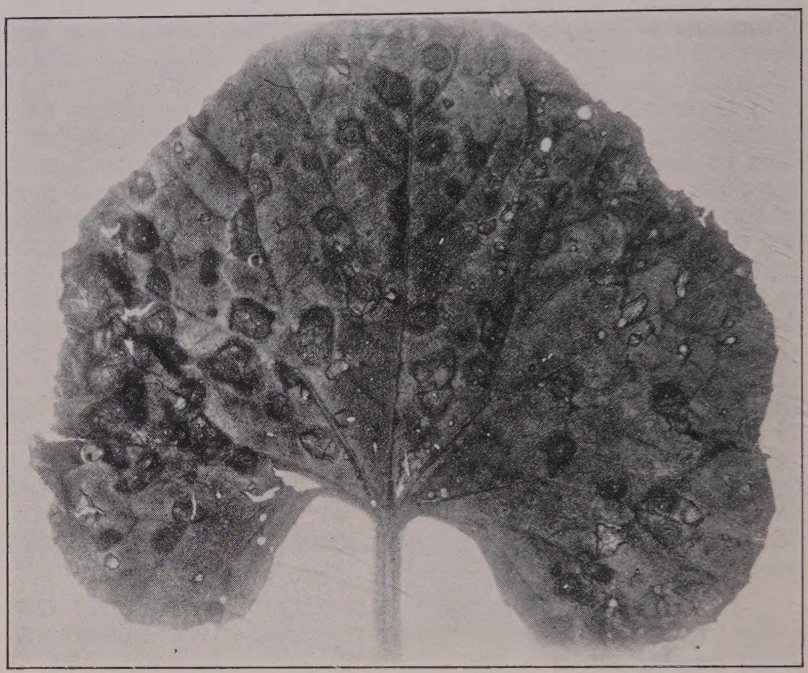
Leaf Spotting produced by "Downy Mildew" fungus which causes prematuring and death of vines. Mature spots are light brown in appearance and angular in form. Where several spots join, the dead tissue often drops out.

lished during the first part of July usually not before the initial set of early planted melons have started to net. The older central leaves are the first to show the disease which gradually spreads from the central growth outwards. The first appearance of the disease is easily overlooked as only a watersoaked spot is produced about one-eighth to one-fourth inch in diameter. This infected area of the leaf tissue soon loses its green color and appears yellow. The greater part of the yellow area soon turns brown, appearing as a conspicuous dead brown spot. The spots enlarge and are of various outlines being oval to elliptical or they may be angular because of development being limited by the larger veins of the leaves. The spots often run together producing large dead areas and the leaves eventually become crinkled and dry up. The fungus develops exposed spores on the undersurface of the leaf spots but they are not evident to the naked eye owing to their limited production. (The disease on cucumbers develops a conspicuous spore mass which on maturity can be recognized as a dusky colored mass.) The sudden collapse of the leaves checks the maturing of the vines and melons. Melons from badly diseased vines are undersized and of very poor quality.

The principal commercial varieties of cantaloupes now being grown in Delaware are all susceptible to this disease and show no resistance of any commercial importance. The only variety that has been observed showing a resistance of commercial importance is the Eden Gem and certain locally improved strains of this variety. This advantage, however, is offset by its susceptibility to Leaf Blight or Rust, however, this disease is more easily controlled than Downy Mildew.

Studies on the life history of the fungus in Delaware have not determined how the disease overwinters.

Leaf Blight or Rust (*Macrosporium cucumerinum*): The principal commercial varieties of cantaloupe grown in the state are resistant to this disease. Unless the spotting on the leaves is carefully examined it may be easily confused with the Downy Mildew Disease. The disease spots are similar in color to the Downy Mildew spot but are more typically circular in outline. The dead brown spots on the leaves show definite concentric lines similar to that of a target which easily distinguishes it from the Downy Mildew spot. The first infection is recognized as a small brown spot the size of a pinhead which gradually enlarges in a circular manner. The concentric zones of the mature spot are the result of the gradual circular growth. Unlike the Downy Mildew, it may first appear on any of the leaves of the vine. It is the most serious disease on the Eden Gem variety and becomes estab-



Leaf Spotting produced by the "Leaf Blight" or "Rust" fungus. The spots are generally circular with typical ring-like enlargements similar to the rings on a target.

lished about the same time as the Downy Mildew disease. Severe infection will result in complete collapse of the leaves.

Leaf Spot (*Cerocospora cucurbitae* and *Septoria sp.*): The leaf spots caused by these two fungous parasites are generally distributed but have never been observed to be of economic importance. They are the first two diseases to appear on the foliage but are easily controlled by the methods recommended for the other plant diseases. The *Cercospora* spot is usually about one-eighth to one-fourth of an inch in diameter and the affected tissue is ashen grey in appearance. The number of spots are very few on a leaf and usually widely distributed over the leaf area. The *Septoria* spot is seldom larger than the head of a pin and very numerous on a single leaf. The mature spot is circular in form. The diseased tissue is white in appearance with often one or two black specks which are the fruiting bodies of the fungus.

Anthracnose (*Colletotrichum lagenarium*): This disease has been observed only on the cantaloupes before they start to net. The spotting and cracking of the smooth green rind is not deeply established and has never been observed the past three years to affect the commercial value of the melons. The disease, however, is very serious on watermellon, pumpkin, squash and citron.

Mosaic (An infectious disease, cause not known): The disease has been considerably on the increase the past three years. The importance of the disease is not fully realized by the growers. Diseased plants show a conspicuous mottling of green and yellow areas on the leaves which are usually crinkled and dwarfed in size. Young infected plants often fail to mature melons. It has recently been proven (by Doolittle and Walker) that the disease overwinters on Pokeweed (*Phytolacca decandra*), Milkweed (*Asclepias syriaca*), Wild Cucumber (*Micrampelis lobata*) and (*Physalis spp.*). The disease may also be spread by insects, and by individuals during cultivating and harvesting. Eradicating the weeds and controlling insects should materially assist in checking the disease.

Insect Pests

There are five insect pests which seriously interfere with the culture of cantaloupes in Delaware known commonly as the Striped Cucumber Beetle, Squash Ladybird Beetle, Melon Lice or Aphids, Cutworms and the Twelve-spotted Cucumber Beetle. These same pests also attack the cucumber, watermelon, pumpkin, and squash.

Striped Cucumber Beetle (*Diabrotica vittata*): This is the first insect that appears on the young plants soon after they push through the ground. These small beetles are recog-

The Striped Cucumber Beetle. A serious pest on the young vines. (After Crosby and Leonard.)

nized by their black heads, yellow thorax and wing-covers with three black stripes lengthwise of the latter. They are very active and when disturbed usually try to hide themselves in crevices of the soil or underneath the leaves. The insects injure or kill the young plants by feeding on the stems or leaves. Many missing hills result from attack by these beetles unless they are repelled or killed by the control methods later recommended. The beetles feed by chewing the leaves and stems of plants soon after they push through the ground. Young plants are usually killed or so weakened they never mature into strong plants.

Squash Ladybird Beetle (*Epilachna borealis*): This insect, also called the Melon Beetle, is much larger than the striped beetle. The adult is not so active but also attacks the leaves. It usually appears on the cantaloupe vines soon after the melons set. The older leaves are first used for feeding and with severe attacks the leaves often collapse causing serious weakening of the vines. The young or larva stage of this

A B

The Squash Ladybird Beetle. The mature beetle (A) that first appears and feeds on the leaves. From eggs laid by the mature beetle are hatched the larva (B) with black branching spines. The larva appear to cause the greatest injury by feeding on the leaves. (After Chittenden, U. S. Dept. Agr.)

beetle is the most active feeder on the leaves. The larva is yellow in color about one-half inch long with black branching spines. Circular network areas on the leaves are the symptoms produced by the young or larva. July, August and September are the months when this insect is most active on cantaloupe. Vines maturing during August and September are most likely to be seriously attacked.

Melon Lice or Aphids (*Aphis gossypii*): Plant lice, unlike the beetles, are sucking insects. They become established any time during the season after the vines commence to run. The Aphids are yellowish green to black in color, and work on the underside of the leaves causing them to curl, lose their color and eventually dry up. After severe attacks by aphis the affected leaves often appear black and melons next to such leaves often show a black sticky coating. This sticky coating on the surface of the leaves and cantaloupes is the honey dew secreted by the aphids which becomes black because of the growth of certain moulds. Complete loss of crop may result where aphis injury is allowed to go unchecked.

Cutworm (*Feltia sp.*): Injury by this pest is not as general in the cantaloupe producing sections as occurs with the three previous insect pests. In several instances, during the past three years work on cantaloupes, the complete initial stand has been destroyed. The loss is caused by the worm chewing off the stem of the young plants at the surface of the ground.

The Twelve-spotted Cucumber Beetle (*Diabrotica 12-punctata*): This pest is commonly found during seasons when the striped beetle is prevalent. Fortunately it has not been observed to be a severe pest under our conditions. The beetles are slightly longer than the striped beetle and are recognized by their yellowish green color and twelve black spots. It appears more active than the striped beetle and besides eating the foliage also attacks the flowers. It has never been observed as being as prevalent or injurious as the striped beetle.

A melon vine, showing effect of attack by Aphids. These sucking insects cause the leaves to curl and soon cause death of the vine.

Dusting Materials for the Control of the Diseases and Insects

The use of dusting materials has proved the most practical and economical method for the control of pests on cantaloupes, as the result of three years field work in the principal cantaloupe producing centers in Delaware.

Because of the prevalence and presence of both fungous and insect pests it is essential to use combinations of fungicides and insecticides in any control methods. The copper fungicides have proved most effective for the downy mildew disease and give complete control of the other leaf spot diseases. Calcium arsenate has proved most effective for the chewing insects and nicotine or nicotine sulphate dust is the only effective material for practical control of aphis.

The most efficient and economical dust used during three years of control work was a copper-lime-arsenate combination containing twenty per cent dehydrated copper sulphate, twenty per cent calcium arsenate, and sixty per cent lime. This combination proved most practical and effective for downy mildew and controlled the leaf spot diseases and beetles.

Nicotine sulphate or nicotine dusts are efficient for control of aphis, and it has been found most economical to have a supply on hand and apply separately as soon as the aphids are present. To secure greatest efficiency of the killing power this dust should be applied when the vines are dry and when the air temperature is 65° to 70° Fahr. Dusts containing five per cent of nicotine sulphate (40%) have proved most efficient. Some investigators find this dust very effective for the striped beetle, but it is more expensive than the copper-lime-arsenate dust, which has proved an efficient repellant in Delaware.

The copper dusts (Dehydrated copper sulphate) have never given absolute control of the downy mildew disease but will sufficiently check the disease and maintain the vigor of the vines so as to allow for maturity of the vines and melons. Copper dusts impart a stimulating effect upon the cantaloupe vines very similar to the effect observed on white potatoes. The application of copper dusts on cantaloupes is fully as important as copper dust on white potatoes for late-blight control. It will improve quality and increase yields of cantaloupes under the conditions of disease prevalence in Delaware.

The most effective control measures for cutworms is the use of "poisoned bait" or "poisoned bran mash." It should be applied before the plants are up or as soon as evidence of injury occurs. One of the most commonly used poisoned baits is prepared as follows:

Bran	20	lbs.
Paris Green	1	lb.
Cheap Syrup	2	quarts
Water	3½	gallons

Mix the bran and the Paris Green, then add this mixture to the syrup dissolved in the water and stir thoroughly. The most common practice in Delaware is to apply it by hand around the young plants in the hill usually late in the afternoon. The expense is small and often saves the expense of reseeding. Where infestation is severe, late fall and early spring plowing will assist in starving out the worms.

Methods of Applications

For the average small commercial acreage in Delaware the handcrank duster (Blower Dust Gun) has proved the most economical and efficient equipment for applying dusts. Three different types of hand dusters have been tried out but the handcrank duster, properly manipulated has proved the most practical investment for the average grower. No extra labor costs are incurred in laying aside or "rowing" the vines as is necessary in order to use a horse drawn power duster. Where growers have a power duster, it is most economically used on the large commercial acreage after the vines have developed runners.

Some growers consider the handcrank duster is wasteful because of the continuous stream of dust, when the plants are young and therefore some distance apart. Proper manipulation of the machine will eliminate any waste of dust. The screen opening should be closed for the finest outlet of dust. The crank can be turned gently, with practically no outflow of dust between the hills and when the vines are reached more pressure will blow out sufficient dust to cover the young vines. When applying the first two applications of dust one can conveniently dust the opposite hills in going down the middle of two rows. Dusting two rows at once, before the vines develop runners saves much time and labor.

It has always been found practical to have the three extension outlets attached. The attachment of the fan-shaped distributor has been of great importance in securing an even distribution of the dust on both surfaces of the leaves. If the fan-shaped distributor is attached so as to be inverted upwards and is pointed about parallel with the leaves, a more even and uniform distribution of the dust is secured upon both surfaces of the leaves. The best covering of the foliage is secured with the minimum loss of dust. The dust is most economically distributed when the leaves are moist with dew. The greatest

Illustrating type and method of using a handcrank duster. The fan-shaped distributor at end of outlet is inverted and held at such an angle that a distribution of dust is secured on both surfaces of the leaves.

efficiency of the dust is not dependent so much upon the amount applied as in the thoroughness and even distribution of the dust application.

Amount and Cost of Dust Applications Per Acre

The amount of dust required per acre of four to five applications will vary from sixty to eighty pounds. This difference is dependent upon various factors, as follows: vigor of vines, number of hills, stage of vine development when dust is applied, prevalence of disease and insect pests and weather conditions.

The vigorous growing varieties require more dust per

acre. The Eden Gem variety is one of the commercial varieties which develops a strong vine growth which results in a larger foliage area to protect.

Soon after the plants have broken through the ground, 1½ to 2 pounds of dust if properly applied, is sufficient for an acre taking about one hour to complete the work. When the vines first show blossoms, 4-5 lbs. of dust are required per acre, taking 1½ hours to complete application. When the first initial set of melons has been made, 25-30 lbs. of dust are required; and when these melons are at full slip stage, 30-40 lbs. of dust per acre are required. When the vines are in the advanced stage of growth, it takes about two to three hours time to dust an acre.

When frequent and heavy rains occur, it is necessary to increase the number of dust applications. The object should be to keep the growth protected in order to secure the maximum efficiency of dust and not endeavor to follow any set number of applications.

The cost of the copper-arsenate-lime dust for the first application will average 15 cents an acre, while an application at the blossom stage averages 45 cents. The two late applications are most expensive, but are of greatest importance under Delaware conditions, and will cost about $2.50 when the first melons are netting and an average of $3.50 for the late application. When five applications are made the total expense of materials will range from $5.50 to $7.50 per acre. In some seasons, when insects were not prevalent, two late applications have given practical control of the diseases. The expense of the dust along with the labor costs are offset by the increased yield and quality of melons compared with those from the untreated vines.

Dusting Schedule for Control of Disease and Insect Pests on Cantaloupes in Delaware

1. *First Application* soon after the young plants push through the ground or when the first evidence of the striped beetle feeding appear. Repeat if beetles again appear prevalent before next application.

2. *Second Application* when vines are in blossom and starting runners for control of beetles and leaf spot diseases.

*3. *Third Application* when initial set of melons have

* See footnote on page following.

started to net, for downy mildew, leaf spot diseases and squash ladybird beetle.

*4. *Fourth Application* two weeks later than No. 3, depending upon the frequence of rains. For same diseases and insects as No. 3.

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* The last two applications are essential for the control of the Downy Mildew Disease. The maturing vines should be thoroughly protected and frequent rains may necessitate additional applications.